

**Claims**

1. A method for separating particles in a fluid according to size comprising the steps of  
a) transporting a fluid containing said particles across a profiled surface carrying at least two  
5 adjacent regions of different depth which form a surface level step, wherein  
- the fluid is transported by mechanically moving a flat first surface across the profiled  
surface,  
- the adjacent regions of different depth are arranged such that the depth of the  
regions decreases in the net direction of a forward displacement of the first surface,  
10 - force is applied such that one surface is pushed towards the other surface, and  
b) allowing the separation of said particles by means of the backflow of excluded particles ,  
said backflow generated by moving said first surface past said profiled surface.
2. A method according to claim 1, wherein where the first surface overlaps with the profiled  
15 surface, the first surface lies flat and parallel to the portions of the profiled surface without  
regions of different depth.
3. A method according to claims 1 and 2 wherein where the first surface overlaps with the  
profiled surface, at least the region(s) of different depth overlap with the first surface.  
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4. A method according to any of claims 1 to 3 further comprising the step of collecting the  
particles from one or more adjacent regions of different depth.
5. A method according to any of claims 1 to 4, wherein the widths of two or more regions  
25 adjacent to the surface level step are different.
6. A method according to any of claims 1 to 5 wherein the regions of different depth are  
micro machined.
- 30 7. A method according to any of claims 1 to 6, wherein the first surface moves in an  
intermittent mode.

8. A method according to any of claims 1 to 7, wherein the first surface moves alternately forwards and backwards, each movement having a duration and a velocity selected such that the net displacement is in the forward direction.

5 9. A method according to any of claims 1 to 8, wherein one or more said regions of different depth regions each comprise an opening into a chamber.

10. A method according to any of claims 1 to 9, wherein said particles are non-covalently bound to said first surface before they reach said surface level step.

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11. A method according to any of claims 1 to 10, wherein a selective force field is applied to selectively and temporarily direct at least one fraction of the particles towards a predetermined surface during a given period.

15 12. A method according to any of claims 1 to 11, wherein a side-outlet channel is provided near at least one side of said surface level step.

13. A method according to any of claims 1 to 12, wherein the particles are collected after the separation by applying a second flow parallel to said surface level step.

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14. A method according to any of claims 1 to 13, wherein said fluid substances are continuously fed at a channel inlet and are continuously withdrawn from one or more outlet channels.

25 15. A method according to any of claims 1 to 14 further comprising, the step of collecting particles at said outlet channel(s).

16. A method according to any of claims 1 to 15, wherein the direction of said surface level step and the mean direction of the flow cross at an angle between 1° and 90°.

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17. A method according to any of claims 1 to 16, wherein said fluid substances are fed at a limited section of the channel inlet only.

18. A device for separating particles in a fluid according to size comprising:

- a profiled surface carrying at least two adjacent regions of different depth which form a surface level step,
- a flat first surface that is capable of mechanically moving across the profiled surface,
- and
- a means for mechanically moving said first surface over the profiled surface,

wherein the adjacent regions of different depth are arranged such that the depth of the surface level steps decreases in the net direction of the forward displacement of the first surface.

19. A device according to claim 18 wherein where the first surface overlaps with the profiled surface the first surface lies substantially flat and parallel to the portions of the profiled surface without regions of different depth.

20. A device according to claims 18 and 19 wherein at least the region(s) of different depth of the profiled surface overlap with the first surface

21. A device according to any of claims 18 to 20 further comprising a means to apply a pressure to at least one surface.

22. A device according to any of claims 18 to 21, wherein the widths of two or more regions of different depth adjacent to the surface level step are different.

23. A device according to any of claims 18 to 22 wherein the regions of different depth are micro-machined.

24. A device according to any of claims 18 to 23, wherein the first surface is capable of moving in an intermittent mode.

25. A device according to any of claims 18 to 24, wherein the first surface is capable of moving alternately forwards and backwards, each movement having a duration and a velocity selected such that the net displacement is in the forward direction.

26. A device according to any of claims 18 to 25, wherein one or more said regions of different depth regions each comprise an opening into a chamber.

5 27. A device according to any of claims 18 to 26, wherein a side-outlet channel is provided near at least one side of said surface level step.

28. A device according to any of claims 18 to 27, further comprising a means to apply a second flow parallel to said surface level step.

10 29. A device according to any of claims 18 to 28, further comprising an inlet channel and one or more outlet channels.

30. A device according to any of claims 18 to 29 further comprising means to continuously feed said fluid to the channel inlet, and withdraw a fluid from one or more outlet channels.

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31. A device according to any of claims 19 to 30, wherein the direction of said surface level step and the mean direction of the forward displacement of the first surface cross at an angle between 1° and 90°.

20 32. A device according to any of claims 19 to 31 wherein the movement of the first surface past the profiled surface generates at least one recirculating flow.

33. Use of a device according to claims 19 and 32 for size-separating particles in a fluid.